beside such determinate dimensions, are by certain inconveniences rendred unuseful; for it will be exceeding difficult *to make and* manage *a Tube above an* hundred foot long, *and it will be as difficult to* inlighten *an Object less then an hundred part of an inch distant from the Object Glass.*

I have not as yet made any attempts of that kind, though I know two or three wayes, which, as far as I have yet considered, seem very probable, and may invite me to make a tryal as soon as I have an opportunity, of which I may hereafter perhaps acquaint the world. In the Interim, I shall describe the Instrument I even now mention'd, by which the refraction *of all kinds of Liquors may be most exactly measur'd, thereby to give the curious an opportunity of making what further tryals of that kind they shall think requisite to any of their intended tryals; and to let them see that the laws of Refraction are not only notional.*

The Instrument consisted of five Rulers, or long pieces placed together, after the manner expresst in the second Figure of the first *Scheme*, where A B denotes a straight piece of wood about six foot and two inches long, about three inches over, and an inch and half thick, on the back side of which was hung a small plummet by a line stretcht from top to bottom, by which this piece was set exactly upright, and so very firmly fixt; in the middle of this was made a hole or center, into which one end of a hollow cylindrical brass Box C C, fashion'd as I shall by and by describe, was plac'd, and could very easily and truly be mov'd to and fro; the other end of this Box being put into, and moving in, a hole made in a small arm D D; into this box was fastned the long Ruler E F, about three foot and three or four inches long, and at three foot from the above mention'd Centers P P was a hole E, cut through, and cross'd with two small threads, and at the end of it was fixt a small sight G, and on the back side of it was fixt a small Arm H, with a Screw to fix it in any place on the Ruler L M; this Ruler L M was mov'd on the Center B (which was exactly three foot distance from the middle Center P) and a line drawn through the middle of it L M, was divided by a Line of cords into some sixty degrees, and each degree was subdivided into minutes, so that putting the cross of the threads in E upon any part of this divided line, I presently knew what Angle the two Rules A B and E F made with each other, and by turning the Screw in H, I could fix them in any position. The other Ruler also R S was made much after the same manner, only it was not fixt to the hollow cylindrical Box, but, by means of two small brass Armes or Ears, it mov'd on the Centers of it; this also, by means of the cross threads in the hole S, and by a Screw in K, could be fastned on any division of another line of cords of the same radius drawn on N O. And so by that means, the Angle made by the two Rulers, A B and R S, was also known. The Brass box C C in the middle was shap'd very much like the Figure X, that is, it was a cylindrical Box stopp'd close at either end, off of which a part both of the sides and bottomes was cut out, so that

that the Box, when the Pipe and that was joyned to it, would contain the Water when fill'd half full, and would likewise, without running over, indure to be inclin'd to an Angle, equal to that of the greatest refraction of Water, and no more, without running over. The Ruler E F was fixt very fast to the Pipe V, so that the Pipe V directed the length of the Ruler E F, and the Box and Ruler were mov'd on the Pin T T, so as to make any desirable Angle with the Ruler A B. The bottom of this Pipe V was stop'd with a small piece of exactly plain Glass, which was plac'd exactly perpendicular to the Line of direction, or *Axis* of the Ruler E F. The Pins also T T were drill'd with small holes through the *Axis*, and through those holes was stretcht and fastned a small Wire. There was likewise a small Pipe of Tin loosly put on upon the end of V, and reaching down to the sight G; the use of which was only to keep any false Rayes of light from passing through the bottom of V, and only admitting such to pass as pierced through the sight G: All things being placed together in the manner describ'd in the Figure; that is, the Ruler A B being fixt perpendicular, I fill'd the Box C C with Water, or any other Liquor, whose refraction I intended to try, till the Wire passing through the middle of it were just covered: then I moved and fixt the Ruler F E at any assignable Angle, and placed the flame of a Candle just against the sight G; and looking through the sight I, I moved the Ruler R S to and fro, till I perceived the light passing through G to be covered, as 'twere, or divided by the dark Wire passing through P P: then turning the Screw in K, I fixt it in that posture: And through the hole S, I observed what degree and part of it was cut by the cross threads in S. And this gave me the Angle of Inclination, A P S answering to the Angle of Refraction B P E: for the surface of the Liquor in the Box will be alwayes horizontal, and consequently A B will be a perpendicular to it; the Angle therefore A P S will measure, or be the Angle of Inclination in the Liquor; next E P B must be the Angle of Refraction, for the Ray that passes through the sight G, passes also perpendicularly through the Glass *Diaphragme* at F, and consequently also perpendicularly through the lower surface of the Liquor contiguous to the Glass, and therefore suffers no refraction till it meet with the horizontal surface of the Liquor in C C, which is determined by the two Angles.

By means of this Instrument I can with little trouble, *and a very small quantity of any* Liquor, *examine, most accurately, the* refraction *of it, not only for one inclination, but for all; and thereby am inabled to make very accurate Tables; several of which I have also experimentally made, and find, that* Oyl of Turpentine *has a much greater Refraction then* Spirit of Wine, *though it be* lighter; *and that* Spirit of Wine *has a greater Refraction then* Water, *though it be lighter also; but that* salt Water *also has a greater Refraction then* fresh, *though it be* heavier: *but* Allum water *has a less refraction then common* Water, *though heavier also. So that it seems, as to the* refraction *made in a Liquor, the* speci-